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Mitigation of Delay in Malaysian Armed Forces Construction Projects

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ABSTRACT

As time passes, the conditions of the camp where most of the buildings, infrastructures and facilities in the Malaysian Armed Forces (MAF) become older and require reconstruction or refurbishment. In line with the global development of many personnel and military equipment, most of the existing buildings in military camps need to be improved. Construction delays in government projects have become a norm, and MAF is no exception to this. The delay issues are important to be investigated to minimize the delays. Perhaps some practical rectification needs to be suggested to mitigate delays and improve the performance of construction projects in MAF. The quantitative approach was carried out using a questionnaire survey to relate stakeholders involved in MAF construction projects that can help to achieve the objective of this research. From 100 respondents of MAF construction project stakeholders, 75 respondents replied with a reliability index of Cronbach Alpha of 0.96. The data was analyzed using SPSS version 24 with ordinal measurement. Pilot studies with 30 respondents were conducted to improve the questionnaire design. Next, Spearman's Rank-Order Correlation was undertaken to list the delays in the appropriate rank and the mean of the element is 266.733. Therefore, it demonstrates the overall respondents approximately agree with the cause of delay listed for MAF construction projects. Out of 65 factors of delays top five were poor coordination, poor communication, poor work supervision, lack of work programming and finally difficulties in project financing with the mean of the delays ranging from 4.85 to 4.76. The study was able to rank the top five mitigation measures to overcome the delays with a mean score of 4.5 and above.

Keywords: Construction delay; mitigation of delay; effects of delay

INTRODUCTION

Project delays happen during the executing phase, which is the third group in the project process. However, there are also delays during the earlier process in the planning stage and the closing process. Every construction project experiences delays, and the extent of these delays varies greatly from one project to the next (Aishatul et al. (2023)). Some projects are only delayed a few days behind schedule others can be delayed over the year (Syed M. Ahmed et al. 2003). Some can be ascribed to multiple sources, some to a single party, and many are more related to systemic flaws or shortcomings than to a specific group.

To manage their planning development for the facilities and infrastructure, MAF Services are using the Housing and Construction Policy, Malaysian Armed Forces Command Volume 3 Chapter 13 (*Dasar Perumahan dan Pembinaan, Perintah Angkatan Tentera Malaysia Jilid 3 Bab 13* (PATM)) as a guide. Type of construction projects involved in Malaysian Armed Forces (MAF) development of technical building for new camps and non-technical buildings such married quarters and training facilities.

DELAYS IN MAF CONSTRUCTION PROJECTS

According to Nunally (1980), construction delays are any extension of the contract's execution period that goes beyond what is specified or any increase in the amount of time needed to finish the project within the predetermined time frame.

According to Agyekum-Mensah and David Knight (2017), a delay occurs when the scheduled time cannot be met. In theory, delays are linked to time overruns and are mostly caused by some factors that are strongly correlated with the project's duration. The length of the time overrun, however, is arbitrary and contingent upon the reasons and the strategies employed to identify and address them. Some can take years, while others just take a few days. According to Malaysian Treasury Circular: PK 4.5, a project is classified as a Sick Project (Projek Sakit) if the contractor is unable to improve the work progress within the allotted time or if the physical work progress has been delayed by more than two months or 20% of the schedule progress, whichever comes first.

Monitoring sick projects until they are finished is the responsibility of a specific unit known as the Implementation Coordination Unit (ICU), which is the implementation arm of projects and programs. In 2022, MAF spent an average of 99.73% of its allocation, but few projects were completed successfully. Either delay or be considered a sick project. Because there have not been many studies done on this topic before, this was done to reach an additional milestone.

Time, allocation, and quality are the three primary factors that determine the project's performance. As seen in Fig. 1 below, the phases separated into six groups.

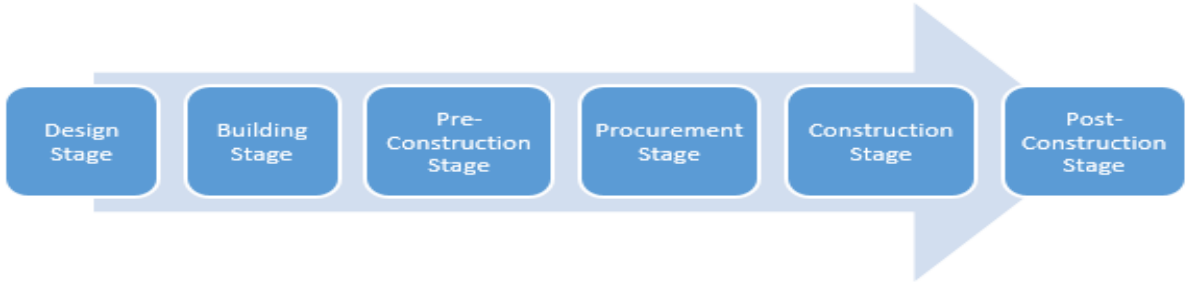

FIGURE 1. Construction Phases

Every project phase is typically distinct from the others based on the related tasks involved. Every phase will require a unique set of management skills that only an experienced individual can handle. If there are any problems or issues, the work will either be delayed, cost more, or be of poor quality. As a result, a meticulous schedule and committed stakeholders are required for each of the six construction project phases.

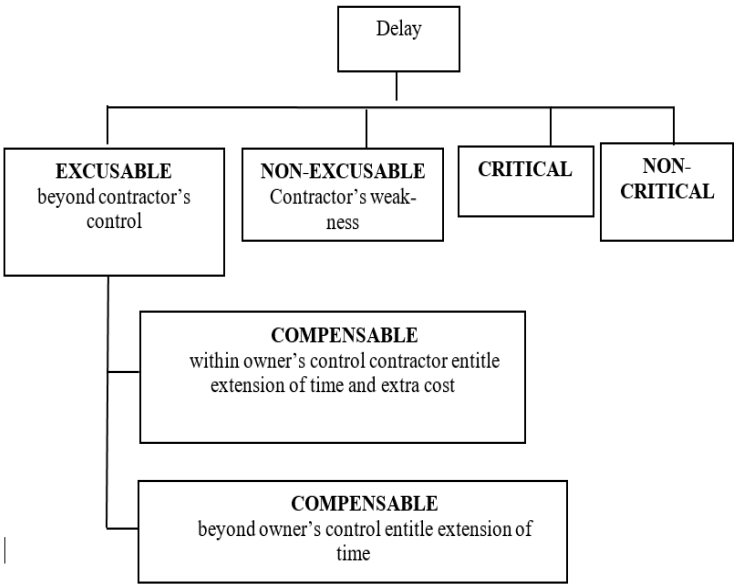

FIGURE 2. Type of Delay (Theodore 2009)

A number of writers had used common terminology to classify different kinds of delays and had connected them in some way. According to Mohammed et al. (2007) and Kraiem and Diekman (1987), there are three main categories of delays: compensable, excusable, and non-excusable. Abonassrya and associates (2023). added additional concurrent construction delay categories. According to Theodore (2009), there are four fundamental ways to classify different types of delays. He added critical and non-critical as additional categories, which are shown in Fig. 2 above.

Delays are the most common problem faced in the construction industry throughout the world. However, the magnitude of the delay varies significantly between types of civilian and military construction projects at different locations or sites. Therefore, various studies were carried out to assess the cause of delays in construction projects.

CAUSES OF DELAY

Construction project delays in Malaysia have been a major problem for many years. Its effects were so profound that they tended to slow down the execution of Malaysia's plans. In their study, Public Project Delay Monitoring by Implementation Coordination, Ghani and Ismail (2017) discovered that contractor-related factors are the primary reasons behind Malaysia's public project delays. This outcome also aligns with the research conducted by Raj (2016), Othman and Ismail (2014), and Abdullah et al. (2010). As a result, it is noted that contractors experiencing financial difficulties, inexperience, and a shortage of personnel, equipment, and supplies will all contribute to delays in the completion of public projects.

Ogunlana et al. (1996) have documented delays in Bangkok, Thailand's high-rise construction projects. As shown in Figure 3, they concluded that there are three layers of delays in the building sector in developing nations. Problems pertaining to the contractor's personal issues make up the first layer, while issues with clients' or consultants' erroneous information and frequent instruction changes make up the second layer. The last layer deals with issues related to the environment or industry, such as a lack of infrastructure for the industry, primarily the supply of resources (materials, labor, and equipment), as well as the nation's environmental conditions.

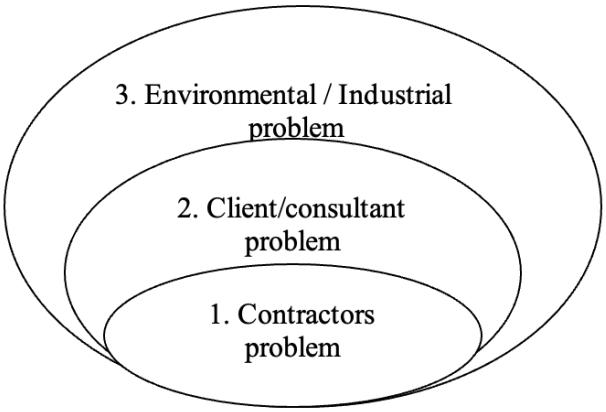

FIGURE 2. Problems that causing delays in Thailand construction projects (Ogunlana, 1996)

EFFECTS OF DELAY

Alghbari et al. (2007) explain that the most frequent, expensive, complicated, and dangerous issue that arises during construction projects is project delays. Chan and Kumaraswamy (1997) highlighted the impact of delays in several studies including Aibinu, A. A. and Jagboro, G. O. (2002), Aibinu, A.A. and Odeyinka, H.A. (2006), Frimpong et al. (2003), Kaliba et al. (2009), Nguyen Duy Long et al. (2004), Sambasivan and Soon, (2007), Abdullah et al, (2009), Ojoko et al. (2016) and Madhav, P. K. and Roshan, R. S. (2024). The six effects of construction delays in Hong Kong, Ghana, Vietnam, Malaysia, and Nigeria were determined by all the researchers to be time overrun, cost overrun, dispute, arbitration, litigation, and complete abandonment.

According to Scott and Stephen (1993), project delivery delays result in both financial penalties and lost profits. Whereby the employer will be required to cover additional expenses like designer fees, project financing costs, and administrative costs. Based on the assertion made by Trauner T.J. (1993), the owner is exposed to the contractor's request for additional loss and expenses as a result of the work disruption.

Arditi and Robinson (1995) mentioned that if the assessment of the loss and expense claim made as a result of the delays is not completed correctly and does not satisfy the owner or the contractor, it is likely to result in legal issues and endanger the relationship between the two parties involved in the construction. Delays in presenting claims can lead to disagreements between the parties and the arbitration process, according to Jagboro and Ali (1999). If arbitration fails, litigation may follow, which will ultimately result in complete abandonment.

Delays in the delivery of supplies and machinery to building sites frequently contribute to project cost overruns according to Manavazhia and Adhikarib (2002). It was discovered that the average impact of these delays on project costs was only 0.5% of the projects' overall budgeted cost. Howick et al. (2009) state that there are two primary reasons why construction projects can experience significant delays and cost overruns: learning for subsequent projects and pursuing compensation from a third party during the project.

MITIGATION OF DELAY

There are several studies carried out in various countries to identify the factors that can facilitate to minimize delays in construction projects. Ogunlana et. al, (1996) suggested a joint effort of participation among the project team and also having an effective project management system in order to reduce delays in construction projects in Thailand. Mezher et. al, (1998) also found in the same note, they have suggested a collaborative or team-building approach between the employer designer and the contractor can improve the time performance of the project. The parties who are involved in planning, specifications and design can work as a team with parties to handle the construction and installation in order to minimise the anticipated delay before the work commences Irfanullah et al. 2023).

Kumaraswamy and Chan (2002) have researched minimizing and faster construction of various building projects in Hong Kong. In their research they have first identified the factors that influence and affect the construction durations. In order to improve the construction time performance of Hong Kong building projects, they have developed specific technological, particularly construction methods, and managerial strategies based on communication management to shorten construction periods in the public, private, and non-residential sectors.

As an alternative to reducing delays in the construction industry, new and creative approaches and technology are required in the design and method of construction. An industrialized building system (IBS), which could reduce labor costs, construction time, and expenses while providing quality and durability, is required to replace traditional building practices in Malaysia. When applied to a building process, IBS can save up to 40–50% of the manual labor input used in conventional construction, according to Warszawski (1999). Furthermore, IBS expedites the construction process, resulting in earlier building project completion.

METHODOLOGY

The choice of a methodological approach for answering the research questions and outlining how the researcher achieves the goals of the study is known as the research design. Schutt (2018 & 2019) stated there are four (4) sorts of social research types, which incorporate descriptive, explanatory and evaluation research. According to Peng (2019), research questions consist of quantitative and qualitative data collection and using deductive and inductive approaches for analyzing the desirable information in a research study. After careful consideration and based on the nature of the research objectives, a quantitative study is conducted to determine the reasons behind project delays in military camps and then recommend ways to reduce them. The above research methodology chart served as the basis for the study's execution.

By measuring the relationship and degree of strength between the variables, a quantitative study is created to understand decisions based on numerical data (Creswell 1994). To find a large sample size for quantitative data analysis, questionnaire surveys are utilized. The purpose of the questionnaire was to gauge the opinions of various stakeholders engaged in the construction of buildings in military camps. This study employed closed-ended questions to reduce response time and take into account the respondent's high degree of knowledge about the subject. According to Naoum (1999), a closed-form questionnaire is simple, quick to complete, and easy to ask. Four (4) distinct sections make up the survey questionnaires.

A pilot study was conducted with 30 respondents to check whether the questionnaire was easy to comprehend by the respondent and precise to the objectives of the research. The pilot study questionnaire was given to four officers the most experienced respondents. Results indicate that some amendments need to be done and the editing process was done. Finally, the questionnaire is clear and understood by respondents. A total of about 75 respondents were involved in the questionnaire survey from 110 contractors from the total population of contractors involved in ATM construction projects. The MAF

respondents were among the MAF contractors who were involved directly in MAF's various class construction projects.

FINDINGS AND DISCUSSION

This paper includes an analysis of the study to identify the delay in the MAF construction project. There were few analyses conducted for this research simple regression method was to select the cause of delay in the MAF construction project.

TABLE 1. Cronbach's Alpha Reliability Test for Cause of Delay

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.960	.963	62

Table 1 shows the mean value of a total of 62 elements of causes of delay in the MAF construction project. The minimum mean is if the respondents answer all questions with strongly agree and the maximum mean is if the respondents answer all questions with strongly agree. As a result, the mean of the element is 266.733, so it demonstrates the overall respondents approximately agree on the cause of the delay listed. Standard Deviation is to quantify the amount of variation or dispersion of set of data values.

Data from survey questionnaire were analyzed by using simple regression method between factor of each stage of delay and the effect of delay. A part of this was the number of respondents scoring 1 to 5 on the significant scale in each factor. The mean score and standard deviation from the most significant causes of delays to the non-significant causes of delays were analyzed for 62 elements. The most significant factors were selected from those having a value of mean score of 4.0 or higher. The data points tend to be very close to the set's mean, also known as the expected value, when the standard deviation is near zero. Table 2 lists all of the delay-causing factors in descending order of mean score values.

As for this study, there are 11 mitigation steps finalised based on the suitability of MAF construction projects. Data from survey questionnaire were analyzed by using simple regression method between factor of each stage of delay and mitigations of project delay. The most significant mitigation of project delay was selected from the value of a mean score of more than 4.5. All the mitigation of project delay is ranked based on mean score values in descending order were presented in Table 2 below.

Based on the result of this study, contractors must follow the project work programme was ranked as 1st significant mitigation of delay in MAF construction projects. The contractor shall prepare a practical and achievable work programme using software for project management such as Primavera, Microsoft Project, Project Management Software, ProofHub and many other tools. The software is a useful and important tool for project managers in developing plans, assigning resources, managing budgets, and analysing and tracking progress. The easier way to understand a work programme is a collection of tasks along a chain of task routes. The advantages of using project management software are effective tracking of the execution of activities to obtain early warning of project risks. It helps in generating a proper report and provides hindsight of what has happened, documenting of quantum of delay and mitigating delays.

Procurement for material and equipment must be synchronized with the work programme was ranked as the 2nd significant mitigation of delay in MAF construction projects. Construction projects involve a sequence of activities which interrelated to relevant resources such as money, manpower, materials, equipment and types of machinery. The planners need to get enough information regarding materials and types of machinery required based on the project scope to produce a realistic work programme.

In line with results on the most significant factors of poor coordination, poor communication, poor work supervision and design problems shows that the causes are due to lack of knowledge and experience in project management lack of experience of the implementing agencies. To tackle this issue, the related parties need to appoint experienced and competent staff. Therefore, the appointment of competent and experienced staff was ranked as 3rd significant mitigation of delays in MAF construction projects.

TABLE 2. Ranking of the Mitigation of Project Delay

Mitigation Steps	Mean Score	Rank	%
Contractor must follow project work programme	4.54	1	54.7
Procurement for material and equipment must be synchronized with work program	4.54	2	54.7
Appointment of competent and experience staff	4.53	3	53.3

continue ...

... cont.

Proper planning should be done before tendering	4.50	4	50.7
Process of approval should be made within duration as stated in contract clause	4.50	5	50.7
Decisions in approval should be made within reasonable duration	4.49	6	53.3
Training programme for staff/personal	4.49	7	49.3
Interference of Client should be avoided	4.48	8	50.7
Documentation in contract must be detail and clear	4.45	9	54.7
Meeting should be held frequently with all participated party of the project	4.45	10	48.0
Adequate project allocation	4.41	11	49.3

The MAF is losing money as a result of building construction project delays. It was acknowledged by all project participants that delays arise during the building phase. The questionnaire survey also revealed that in order to avoid the problems causing the delay, intensive management is required. These findings show that everyone involved, including the main players, has a personal responsibility to minimize and prevent delays. The findings of the study offer helpful guidance for managing the delay with appropriate mitigation techniques.

CONCLUSIONS

There are 50 causes of delay that has been identified from the comprehensive literature review. Based on the 75 respondents in the questionnaire, the top ten significant delay factors in MAF construction projects were identified as poor coordination, poor communication, poor supervision, lack of work programme (ineffective planning and scheduling), difficulties in project financing, rework due to errors during construction, conflicts between parties (contractors, subcontractors, consultant and SO (PP)/ Client), design problem, project duration not realistic, SO (PP) - lack of knowledge and experience in project management, suspension of works, slowness in process of making decision and SO (PP) - lack of knowledge on contract administration. The respondents are directly involved in planning, contractual process, construction and handing over. Therefore, the result of the research is significant to the delay problem in MAF construction projects. Overall, all the mitigation steps played a very important role in the MAF construction delay as this had a huge impact on improving the project timeline. Many issues can be resolved by implementing the mitigation measures listed above. For a project to run smoothly and without any delays this plays a very important role. This indicates that there are no set processes for reducing project delays; rather, it relies on the reasons, type of issue, and resources available. In conclusion, minimizing the risks of delays requires identifying the causes and putting the necessary preventative measures in place.

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DECLARATION OF COMPETING INTEREST

None.

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